

# COVID-19 Vaccination

## Side Effects and Post-Vaccination Behavior

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# Vaccine effectiveness

- COVID-19 vaccinations prevent
  - Nearly all cases of severe illness requiring hospitalization
  - Most people from developing symptomatic COVID-19 disease.
  - Vaccines have also been shown to reduce severity of illness in those who still get COVID-19 after vaccination.
- COVID-19 vaccinations also help to reduce rates of virus transmission
- Many people do experience side effects after receiving a COVID-19 vaccination.
  - These side effects are short-lived and much less threatening than the potentially life-threatening symptoms of COVID-19, and the disease's possible long-term effects.



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# Vaccine side effects

- Approximately 55-83% of individuals develop mild to moderate side effects within the first 3 days post-vaccination.
- Common side effects include:
  - Sore arm, muscle pain, chills, headache, fatigue, fever, stomach pain and nausea , skin rashes
  - Side effects generally last for 1-3 days , if they occur at all
  - One should plan for a day of rest and recuperation after getting vaccinated
- Side effects occur more commonly when people get the second dose of the two dose vaccines\*
- These symptoms indicate that the vaccine is stimulating the immune system, creating B and T Cells able to recognize and combat the infection.

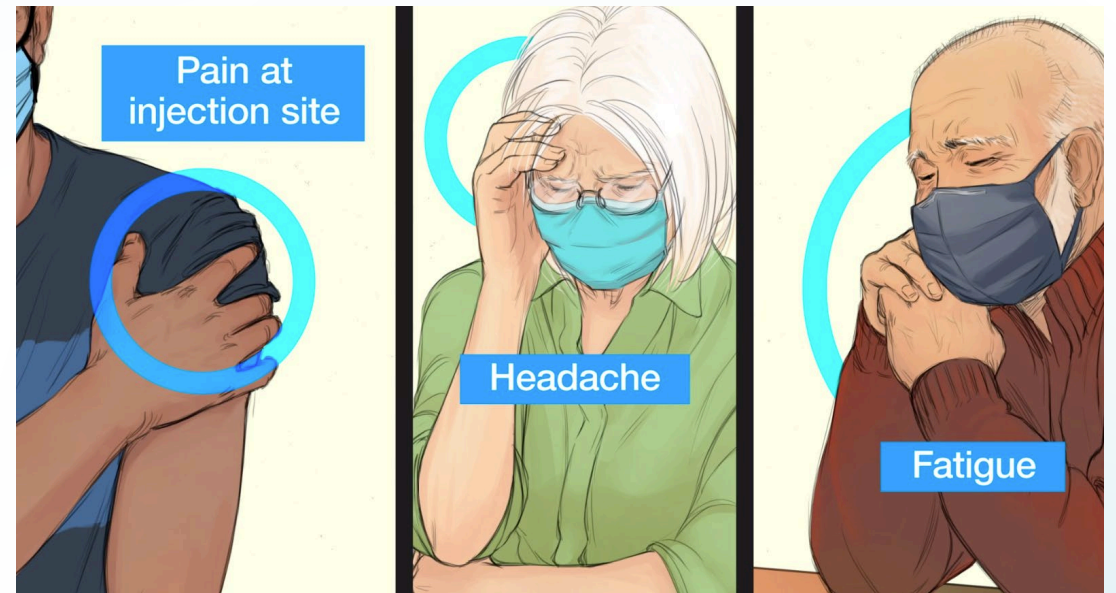


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# Vaccine side effects

- If you experience relatively mild side effects from a vaccine, this means that your immune system has started a response to the vaccine.
  - This is one way that you can tell your immune system has initiated a response to the vaccine!
- Even if you don't experience any side effects, the vaccine is still causing an immune response. Some individuals' responses just result in more demonstrable symptoms after inoculation.



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# Vaccine side effects

- Public health officials and vaccine developers need to warn people that the COVID-19 vaccines may have side effects that mimic the symptoms of a mild COVID-19 disease.
  - By being transparent about the possible discomforts people may experience, they will be less likely to be scared away from getting the second scheduled dose of the vaccines.
- In short, the public needs to be encouraged to think of short-term vaccine side effects as evidence that the vaccine is working as intended and of side effects as a “positive response” instead of an “adverse reaction.”

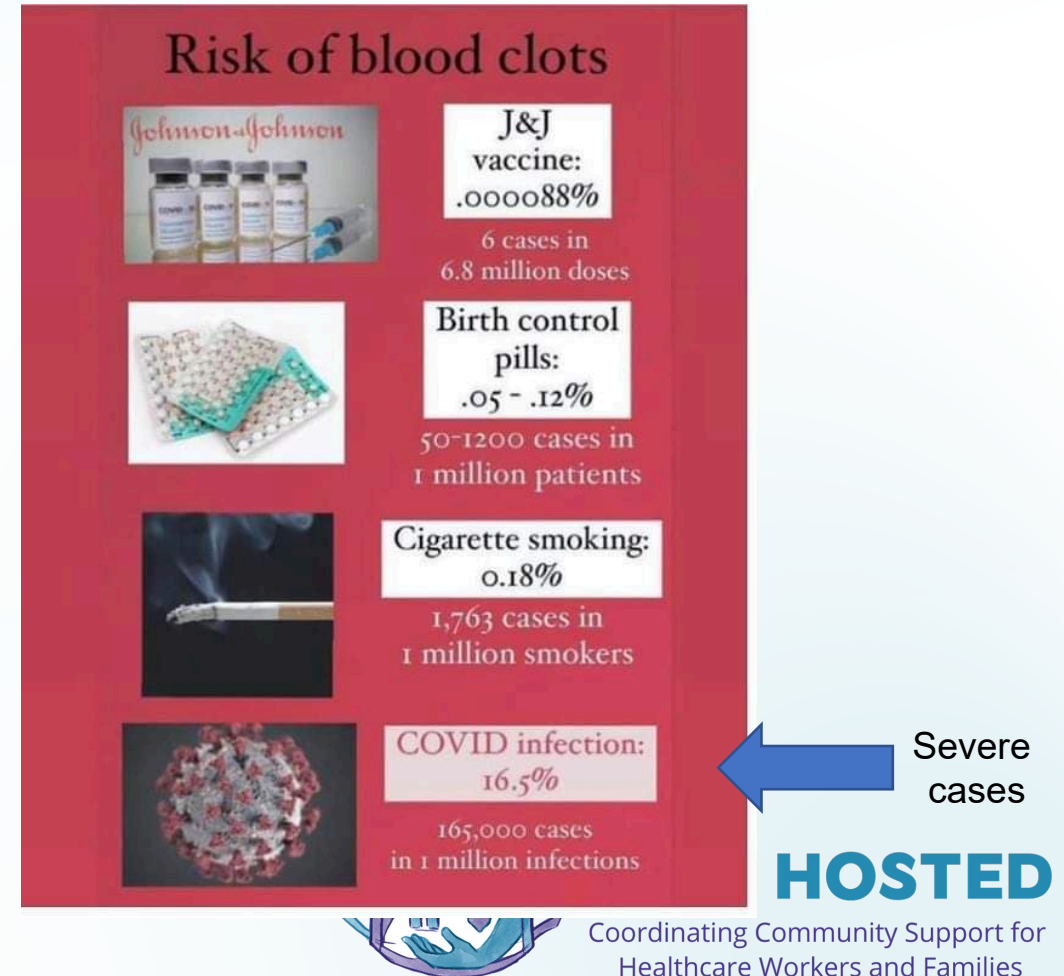


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# What about the reports of blood clots associated with Johnson and Johnson and AstraZeneca vaccines?

- It is important to pay attention to all reports of vaccine related adverse events no matter how uncommon because trials deal with thousands of subjects, but they are then rolled out to millions of people
- On the other hand, when considering risk, it is important to put adverse events into perspective especially when they are rare





# AstraZeneca's and J&J's vaccines share a platform

- Both are [viral-vector vaccines](#), which introduce a coronavirus gene into the body using a genetically engineered [common-cold](#) virus, called an adenovirus.
  - Medical experts are now investigating whether that technology itself could be linked to clotting.
  - Regulators haven't discovered the same clotting issues with the Pfizer and Moderna vaccines, which rely on mRNA technology
- The particular blood clot in question, central venous sinus thrombosis (CVST), forms in the brain — it can lead to headaches or stroke.
- In an average year, this condition occurs in about five people out of every million.
- By early April, European medical officials had identified [169 CVST cases out of more than 34 million people](#) in the European Union who'd received AstraZeneca's shot. That's still just five cases per million shot



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# AstraZeneca Blood: Adverse reaction or expected event in general population

- Several countries have temporarily suspended roll out of Astra Zeneca COVID-19 vaccination because of fear about blood clots
- The European Medicines Agency reported 30 “thromboembolic events” after around 5 million vaccinations
  - In Norway, one death and three hospitalizations were reported in days following vaccination
- Key question: How many of such deaths would be expected anyway in the general population?
  - Deep vein thromboses (DVTs) occurs in around one person per 1,000 each year, probably more in the older population being vaccinated.
  - Out of 5 million people getting vaccinated, one would expect more than 5,000 DVTs a year: 100 every week.
    - Not at all surprising that there have been 30 reported events
- This is the reason RCT trials employ an active vaccine and a control injection (placebo or vaccine for another disease) and why trails need to take stock of age (gender, comorbidity etc.) differences in vaccine response



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# How about gender and rising concerns about blood clots?

- Most of the CVST cases following AstraZeneca's shot occurred in women under 60, while all six J&J cases were reported in women between 18 and 48.
  - There are many possible factors. For example:
    - Young women have higher levels of estrogen, which makes them more likely to have strong immune responses in general.
    - Women have more T-cell receptors, which can prompt the immune system to react aggressively to foreign invaders.
- However, with just such a rare event, it is far too early to conclude that women are at significantly greater risk to blood clots. At this point, more data needs to be collected and analyzed to determine why some people develop clots after either shot, if indeed the shot is responsible.



# To date, the CDC's reporting system has not received evidence linking any deaths directly to vaccines

- And yet, on almost half of all the days so far in 2021, a story about someone dying after receiving a vaccine shot has been among the most popular vaccine-related articles on social media, according to data from the media intelligence company NewsWhip
- **Beware of sensationalist media and social media accounts of deaths following vaccination that confuse association with causation.**
- 8,000 people a day die in the USA due to some cause. More than a few people are bound to die after being vaccinated. This doesn't mean vaccinations were responsible.



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# Transparency about side effects of vaccines is a trust issue



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# What about reactions in people with allergies?

- People with minor allergies may experience a reaction such as a skin rash, breathlessness, or a drop in blood pressure.
  - Reactions like this are uncommon for most people with minor allergies
  - These reactions are short lived and do not result in long term consequences
- Only people with a history of severe allergies are at risk of anaphylaxis (immediate severe allergic reactions) after receiving the vaccination, a situation easily taken care of by using an epi-pen on site at all vaccination centers.
- In the rare case that anaphylaxis should occur, it generally occurs within 15 minutes of vaccine administration. For this reason, people with a history of severe allergies are asked to wait at the place they receive their vaccination for 30 minutes rather than 15 minutes.





# Avoid preventive pain relievers before getting a COVID vaccine

- It is best not to engage in premedication with ibuprofen or Tylenol before COVID-19 vaccines due to a lack of data on how it impacts the vaccine-induced immune responses.
  - There is a chance these pain relievers may prevent parts of the immune system from working and slow down the immune response.
- The side effects from the vaccines are caused by activation of the immune system.
  - If fever, chills, headaches develop after injection, use pain relievers to help with your symptoms, but not before side effects they develop.
- Pain relievers and fever reducers are not intended for use before symptoms appear. If you had a substantial reaction to the first dose, talk to your doctor or medical provider before vaccination to decide if you should take any over-the-counter pain relievers before receiving the second dose.



# How long does it take for vaccines to be effective?

- COVID-19 vaccines are NOT immediately effective
- Protection from either of the two shot COVID-19 vaccines presently available doesn't start until 12 days after the first shot, reaching 52% effectiveness just prior to receiving your second dose.
  - The same is true for the Johnson and Johnson single shot vaccination
- A week after the second vaccination, the effectiveness rate hits 95%.
- In the case of some COVID-19 variants like the UK and South Africa variants, the vaccines with Emergency Use Authorization are still effective, but less so.
  - They have shown to still be more effective to preventing severe COVID-19 than seasonal flu vaccines are in preventing flu, whose effectiveness range between 40-60%.



# COVID-19 vaccines protect you from symptomatic disease, but you may still infect others

- After being vaccinated you have decreased risk of developing symptomatic disease and risk of potentially transmitting the infection if you are exposed to the virus.
- However, this does not mean you cannot harbor and transmit the virus.
- You may still get the virus and be asymptomatic.
  - In this case, you are contagious, although less contagious than if you were symptomatic.
- For this reason, it is essential for you to continue physical distancing and wearing a mask to protect others around you.



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# You need to continue to physically distance and wearing a mask after being vaccinated!



























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## Fully vaccinated means:

- 2 weeks after their second dose in a 2-dose series, such as the Pfizer or Moderna vaccines
- Or 2 weeks after a single-dose vaccine, such as Johnson & Johnson's

	Unvaccinated People	Examples of Activities	Fully Vaccinated People
		<b>Outdoor</b>	
Safest		Walk, run, wheelchair roll, or bike outdoors with members of your household	
		Attend a small, outdoor gathering with fully vaccinated family and friends	
		Attend a small, outdoor gathering with fully vaccinated and unvaccinated people	
Less Safe		Dine at an outdoor restaurant with friends from multiple households	
		Attend a crowded, outdoor event, like a live performance, parade, or sports event	
		<b>Indoor</b>	
Less Safe		Visit a barber or hair salon	
		Go to an uncrowded, indoor shopping center or museum	
		Attend a small, indoor gathering of fully vaccinated and unvaccinated people from multiple households	
Least Safe		Go to an indoor movie theater	
		Attend a full-capacity worship service	
		Sing in an indoor chorus	
		Eat at an indoor restaurant or bar	
		Participate in an indoor, high intensity exercise class	

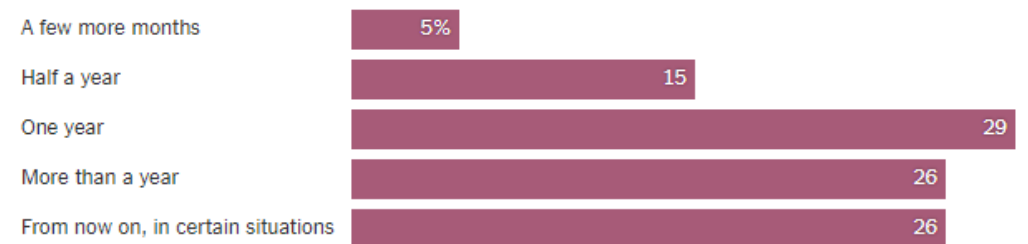
# Many epidemiologists have concerns about the new CDC guidelines

- Many epidemiologists advise the public to wear masks in large public indoor settings until vaccination rates reach 80%.
- Many also continue to advise wearing masks in crowded indoor settings when you are not sure of the vaccination status of those around you, especially in settings with poor ventilation.
- This is primarily to protect high-risk people and those who cannot be vaccinated, like young children or people who have underlying health conditions.

In large crowds outdoors, like at a concert or protest, 88 percent of the epidemiologists said it was necessary even for fully vaccinated people to wear masks.

## Epidemiologists on How Long They Thought We'd Be Wearing Masks Indoors

If you had to predict, how long will Americans need to wear masks when indoors with people whose vaccination status they don't know?



Based on responses by 570 academic and applied epidemiologists. The informal survey was conducted from April 28 to May 10.



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# Millions of immunocompromised Americans will still be at risk to COVID-19 despite getting vaccinated

- For millions of immunocompromised Americans, about 3 to 4 percent of the U.S. population, COVID-19 may not work fully
- Emerging research shows that 15 to 80 percent of those with certain conditions, such as specific blood cancers or who have had organ transplants, are generating few antibodies after vaccination
- The CDC decision to rescind almost all masking and distancing recommendations for those who are fully vaccinated does not serve this group well
  - Many such people have expressed frustration noting that the change leaves them with more fear and less — not more — freedom. Their risk of infection grows as more of their neighbors and co-workers take off their masks.



# The immunocompromised matter

- The ability of those who are immunocompromised to fend off COVID-19 is not just a footnote in the pandemic involving one unlucky group.
- It is potentially a critical part of an evolving phenomena wherein new, more contagious variants are continuing to emerge worldwide.
- The question is whether, and to what extent, these people can act as incubators for mutations that lead to new variants



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# It appears that many unvaccinated people will stop wearing masks unless required to do so: this will undermine community immunity

- The science suggests that if you are fully vaccinated, you are protected when entering a space with people who may not be vaccinated.
  - But what about people not vaccinated and not protected?
- It is difficult, without documentation, to ascertain if someone is vaccinated in public spaces.
  - It is likely that if asked the unvaccinated will lie and say yes
  - Documentation may also be easily forged
- An Economist/YouGov poll released in early May 2021 found that 63 percent of Americans who said they didn't plan to get vaccinated said they felt at least “somewhat” safe socializing indoors with other unvaccinated people without a mask
- That same Ipsos poll also showed that a previous (and more limited) relaxing of the CDC masking guidance led to a significant increase in unvaccinated people taking off their masks.
  - While on April 19, 23 percent of unvaccinated people said they either “never” or only “occasionally” wore a mask, the number rose to 34 percent by May 3.



# Nurses Union questions new CDC Mask Guidance

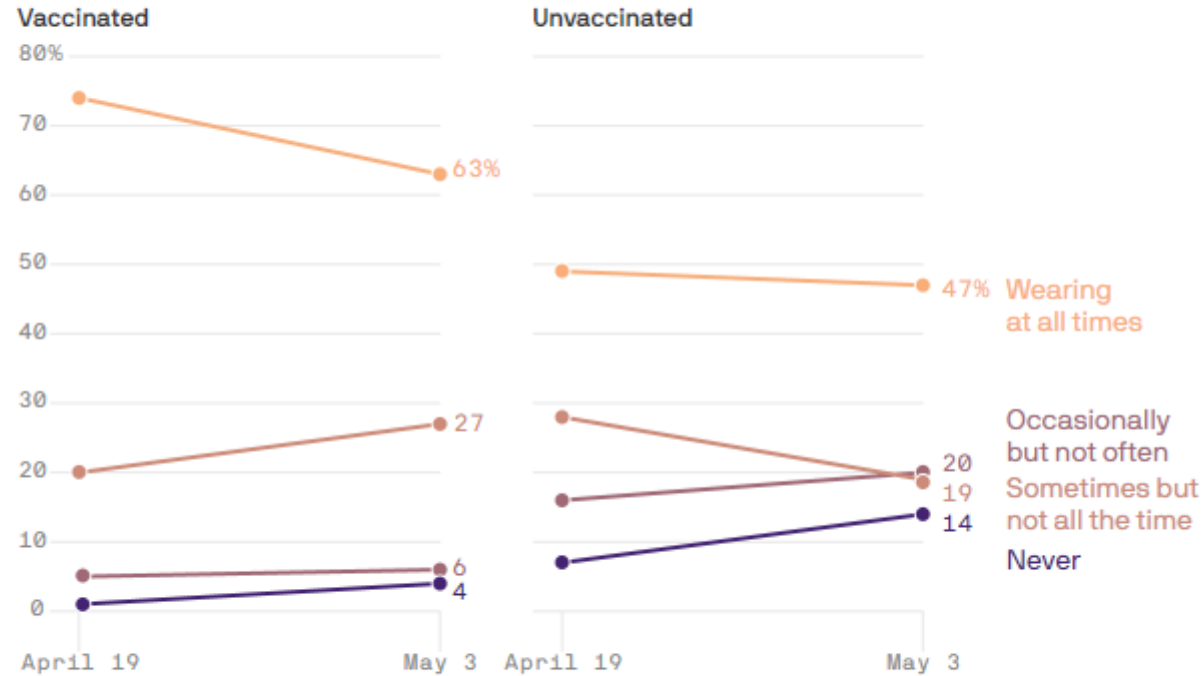
- Labor union leaders representing 170,000 nurses came out against the Biden administration's new mask recommendations that fully vaccinated people no longer need masks
  - They have issued a detailed report Multiple Measures, Including Masks, Needed to Curb COVID-19 that critiques the CDC's decisions about masks\*
- The report emphasizes that Preventing Asymptomatic and Mild Infections Remains an Important Aspect of Combatting the COVID-19 Pandemic, and that this requires mask wearing until the vast majority of the American public is fully vaccinated and community immunity is assured
  - That is far from the current scenario despite impressive vaccination gains January-May. Indeed, the Infectious Diseases Society of America has issued a statement saying that the CDC's shift "should not send the message that the pandemic is over"
- CDC guidance fails to recognize, that essential workers, especially people of color who have already borne the brunt of this pandemic, will be placed at increased risk by rescinding the advice to wear masks indoors



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# Change in masking practices when leaving home

Surveys of 1,022 vaccinated and unvaccinated U.S. adults, weeks ending April 19 and May 3, 2021



Data: Axios/Ipsos Poll; Note: 3.3% margin of error; Chart: Sara Wise/Axios



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# Impact on vaccinations on variants

- Some of these variants have been identified to have potentially increased fitness to current antibody treatments and vaccinations.
  - E.g. the Johnson & Johnson and Novavax vaccines, which were trialed in parallel in multiple countries, seem less effective in South Africa—falling from [72 to 57 percent efficacy](#) and [89 to 49 percent efficacy](#), respectively.
  - The two mRNA vaccines still appear to maintain higher efficacy against these strains.
- This does not mean that the vaccines are ineffective. You should still receive the vaccination when you are eligible to receive it. Current research still supports the conclusion that the protection you gain from vaccine-acquired immunity is much more robust than that conferred from infection-acquired immunity, and the likelihood that you would experience severe COVID-19 disease given you happen to develop the disease after vaccination is significantly lower than if you were not vaccinated.



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# Variants and vaccines : the strain of COVID-19 matters when it comes to viral transmission

- Example: For the South Africa variant, vaccines still provide greater than 85% protection from getting severely ill with COVID–19.
- However, when you count mild and moderate cases, vaccines provide, at best, only about 50%-60% protection.
  - Ex. Johnson & Johnson and Novavax vaccines, which were trialed in parallel in multiple countries, seem less effective in South Africa—falling from [72 to 57 percent efficacy](#) and [89 to 49 percent efficacy](#), respectively.
  - The two mRNA vaccines still appear to maintain higher efficacy against these strains
  - That means at least 50% of vaccinated people will still have a strong enough infection – and enough virus in their body – to cause at least moderate disease
- In the case of this variant, there is a significant probability that a vaccinated person can still acquire an infection and transmit the variant strain



# Do I need a second vaccination if I have had COVID-19 or tested positive?

- Even if you have tested positive or experienced COVID-19 in the past, you are advised to get a vaccination.
- There is some debate as to whether you will need to get both doses of a two-shot vaccine – stay tuned for more information as it becomes available.
  - What we do know is that those who have experienced mild cases or are asymptomatic may well mount a weaker immune response compared to those who have been seriously ill. They generally have a good antibody response for at least 3 months.
- Your best bet is to get the second vaccination in a timely manner.
  - Each dose of the vaccine acts like a booster that enhances both antibody response as well as T cell response. It gives you added protection especially if you have tested positive more than 90 days ago.
  - It may offer you added protection against a wider range of COVID-19 strains.



# After getting fully vaccinated, will a “COVID test” tell me if I now have antibodies and am immune to the virus ?

- The only way to tell whether you would have antibodies is to give a blood sample for an antibody test.
  - This is a serological test primarily designed to estimate the percentage of the population previously infected with the virus.
  - Antibody test results are especially important for detecting previous infections in people who had few or no symptoms.
- You should not take a diagnostic tests (rapid antigen tests or PCR tests) to determine whether you have antibodies.
  - Diagnostic tests only tell you about whether you are infected at the time you take the test.
  - They will not tell you about whether your vaccination mounted an immune response.
- However, the CDC discourages seeking out an antibody testing to assess your immunity after getting the vaccine.
  - There is still a possibility you may test negative on an antibody test
  - Antibodies are only part of a person’s immune system response. Some studies have shown that protective T cells, a white blood cell that helps protect against disease, have been elevated in some patients with COVID-19, even though the patients had no detectable antibodies.



# If I was hospitalized with COVID and received Remdesivir or monoclonal antibody treatments, can I still receive the vaccine?

- Yes, you can still get the vaccine if you were treated with [Remdesivir](#).
- If you received either convalescent plasma or one of the monoclonal antibody treatments like [Bamlanivimab](#), the antibodies received might interfere with your body's response to the vaccine.
- It is recommended to delay vaccinations for 90 days after receiving these treatments.



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# Vaccinations are worth the extremely small risk of a serious adverse reaction and the hassle of short-lived side effects

This is true given both a herd immunity and Endemic, Seasonal flu-like scenario where boosters may be necessary



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# Four big benefits of COVID-19 vaccinations

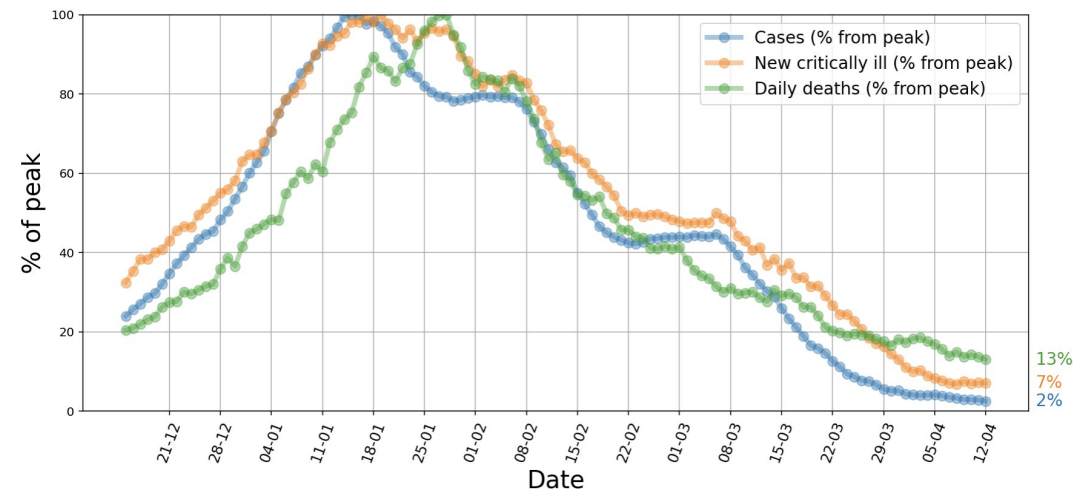
- They prevent serious cases of COVID-19 that will land you in the hospital and they prevent COVID-19 related mortality almost completely
- Greatly reduce the chance of transmitting the infection.
  - While migration in public around the unvaccinated is still important, being vaccinated allows you to reengage in social activities
  - Vaccination has a strong population health advantage. The more people who get vaccinated the less chance of variants emerging and spreading
- Reduce the chance of reinfection if you had COVID-19 already .
  - They reduce your chance of catching other variant strains.
- Prevent long hauler effects from being infected with COVID-19
  - Between 1/3 -1/5 people who have experienced infection have persisting symptoms
  - Persisting symptoms may occur even if you have had a mild case.



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# Herd Immunity Success story : Israel's 73rd independence day also marks its exit from COVID-19

- Since mid-Jan. peak:
- 85% of 16 y/o & above of citizens have been vaccinated/infected
- 98% fewer cases
- 93% fewer critically ill
- 87% fewer deaths
- Public life is close to pre-COVID



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# What if we cannot reach herd immunity by vaccinating the world against COVID-19?

- While COVID-19 vaccines are very good at preventing disease, they may not be good enough to stop transmission of the virus, which is key to herd immunity.
- “On the whole, we should expect immunity to be less effective against transmission than against disease, to wane over time, and to be eroded by the new variants now emerging around the world.” \*
  - Even if herd immunity remains theoretically within reach, > 15 percent of Americans say they will never get a COVID-19 vaccine, making the herd immunity threshold hard to reach.
  - Globally reaching herd immunity is an immense task –think how long this took with smallpox and polio. Our borders are porous and travel between countries is common.
- This scenario may ultimately require annual COVID-19 boosters tailored to combat variants as they become more prevalent.





# Why is vaccination still so important given a non-herd immunity scenario?

- Widespread vaccination to COVID-19 will reduce hospitalizations and deaths by mitigating the disease's severity. In short, it will prevent overwhelming of the health care system.
  - We don't need to achieve full herd-immunity to slow transmission.
  - With less transmission, fewer people will get exposed, and if those who are exposed have been vaccinated, even fewer will develop severe disease or die.
- COVID-19 control, if we do not reach global herd immunity, is an achievable goal.
  - We should continue to vaccinate both locally and globally and find better drugs to treat serious cases when they do occur.

